MAURY ISLAND AQUATIC RESERVE SITE PROPOSAL APPLICATION

1. GENERAL SITE INFORMATION

A. Site location:

The Maury Island aquatic reserve is located in south-central Puget Sound and southwestern King County and includes approximately 3200 acres of aquatic tidelands and bedlands. The reserve boundaries extend from Neill Point to the shores between Point Robinson and Luena Beach (figure 1). The reserve area includes the bedlands and state owned tidelands surrounding Maury Island and all of Quartermaster Harbor, and extends waterward of the lower low tide line to a water depth of 70 feet below mean lower low water or one-half mile from the line of extreme low tide, whichever is further waterward.

B. Site Overview:

1. General site description

The aquatic lands along the east and south sides of Maury Island consist of a contiguous stretch of drift cell of representative south-central Puget Sound aquatic environment. Quartermaster Harbor is a relatively shallow, protected embayment between Maury and Vashon Islands.

2. Boundaries description (include section, range and township, county)

The tidelands and bedlands of navigable waters, owned by the State of Washington, described in the November 17, 2000 withdrawal order as follows:

Those tidelands and bedlands surrounding Maury Island, which are fronting and abutting Section 14, Sections 20-23, inclusively, and Sections 28-32, inclusively, Township 22 North, Range 3 East, W.M.;

Together with, those tidelands and bed lands lying westerly of said Maury Island which are fronting and abutting only those portions of Sections 9 and 16, which are fronting on Quartermaster Harbor, Township 22 North, Range 3 East, W.M.;

Together with, those tidelands and bedlands lying southerly of said Maury Island, which are fronting and abutting Sections 5 and 6, Township 21 North, Range 3 East, W.M.; and said reserve extends waterward to a water depth of 70 feet below mean lower low water OR one-half mile from the line of extreme low tide, whichever line is further waterward;

Those tidelands and bedlands lying southerly and easterly of Vashon Island, which are fronting and abutting Section 1, Township 21 North, Range 2 East, W.M.;

Together with, those tidelands and bedlands lying easterly of said Vashon Island, which are fronting and abutting Sections 24, 25, and 36 Township 22 North, Range 2 East, W.M.;

Together with, those tidelands and bedlands lying easterly of said Vashon Island, which are fronting and abutting Sections 17-20, inclusively, Township 22 North, Range 3 East, W.M.;

Figure 1: Overview of Maury Island Aquatic Reserve Site Proposal

Together with, those tidelands and bed lands lying southerly westerly of said Vashon Island, which are fronting and abutting only those portions of Section 8, which is fronting on Quartermaster Harbor, Township 22 North, Range 3 East, W.M.; and said reserve extends waterward to a water depth of 70 feet below mean lower low water OR one-half mile from the line of extreme low tide, whichever line is further waterward.

3. Current ownership (include detailed ownership map). Identify the intertidal & subtidal areas included in the site

Most of the actual reserve area is located in the subtidal. Roughly 12% of all the intertidal area of Quartermaster Harbor and the east side of Maury Island is owned by the state and included in the reserve. The remainder of the intertidal area is not owned by the state and therefore not included within the boundaries of the reserve area being evaluated. Some of the intertidal area of western section of inner Quartermaster Harbor was purchased from the state under the Bush or Callow Acts (1895). Allowable uses of lands purchased from the state by private parties through the Bush and Callow Acts include: leaving lands fallow (Bush Act only), active cultivation of edible shellfish in the intertidal zone, or the active cultivation of specific shellfish species that were actively being cultivated (planted) prior to December 31, 2001 in the sub-tidal zone. The State of Washington retains reversionary rights to private tidelands purchased through the Bush or Callow Acts. However, there are no plans by the state to exercise these rights. All of the subtidal area of the reserve is owned by the state and managed by DNR (see figure 1).

All references to "site, " "reserve," "reserve area," "shoreline" or other geographic references to the actual aquatic area being proposed for the aquatic reserve should be made in context to the language in Section 3, current ownership and the site map provided in Figure 1.

4. Current county shoreline designation and description

Most of the reserve area shoreline is designated conservancy environmental (figure 2). The purpose of the designation is to maintain the existing character of the area and protect, conserve, and manage existing natural resources and valuable historic and cultural areas. A smaller percentage of the shoreline is designated as rural environmental. The purpose of this designation is to restrict intensive development, maintain open spaces and opportunities for recreational uses within the ecological carrying capacity of the land and water resources.

C. Justification for proposal: (briefly summarize the reason for establishing the aquatic reserve)

The Maury Island site was proposed as an aquatic reserve in the year 2000 to protect relatively undisturbed and functional aquatic habitat that is representative of south-central Puget Sound. The reserve was also intended to protect and restore aquatic habitat, baitfish stocks and salmonid species that utilize the reserve area for spawning, rearing and migration. The herring stock that utilizes the reserve area (see figure 4) is the largest spawning stock in southern Puget Sound.

Habitat values	Species
Salmon migratory corridor	Chinook salmon
Salmon rearing habitat	Juvenile chum salmon
Forage fish spawning	Coho salmon
Eelgrass	Cutthroat trout
Primary production	Pacific herring
Contiguous stretch of drift cell (eastern shore of Maury Island)	Sand lance and surf smelt
	Geoducks
Surface water transport of plankton	Western Grebe
Rearing habitat for herring larvae	

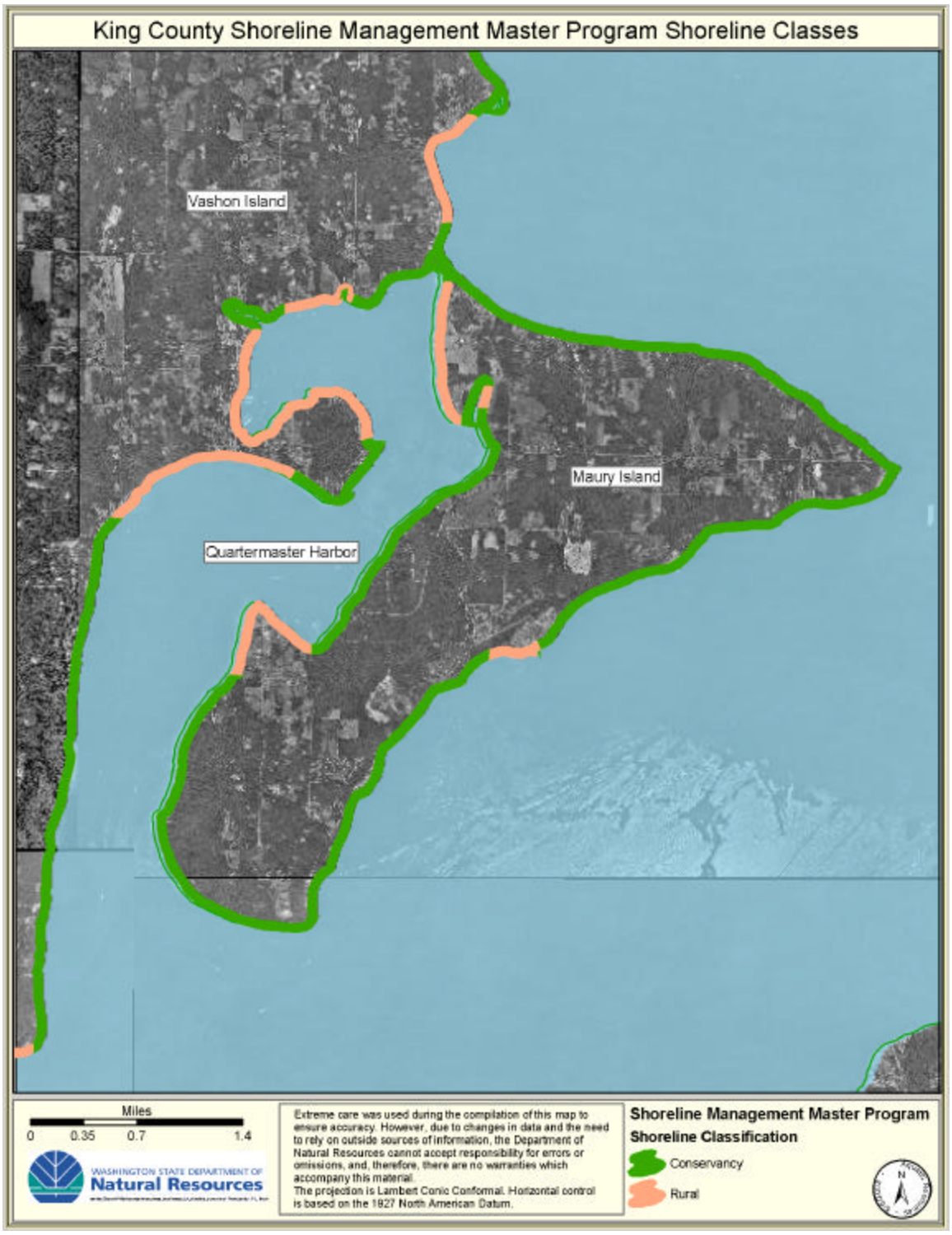

Figure 2: Shoreline Classifications in King County.

D. The ecological and cultural quality of the site

1. What is the current condition of the site?
    - Is the site degraded?

The reserve occurs primarily in the subtidal zone (where state-ownership primarily occurs). However, the condition of the intertidal areas, regardless of ownership, can significantly impact the adjacent subtidal areas that make up the reserve. Shorelines adjacent to the site are modestly degraded. 60 % of the shoreline has been modified through anthropogenic development, and in addition none of the shoreline has been completely altered (Berry et al. 2001). This compares to 59.1% modified shorelines and 18.3% man-made shorelines in the Central Puget Sound Basin. Thus, despite being more sparsely settled and less developed than many parts of Puget Sound, this area has approximately the same level of shoreline armoring as the Central Puget Sound Basin. However, a substantial portion of the shorelines in the Central Puget Sound Basin have been modified so intensely that they are now classified as 'man-made' and none of the shoreline within the reserve site have been altered to this extent. Additionally, Raab's lagoon in Quartermaster harbor has been artificially constrained by a structure across the face of the lagoon, which limits the tidal range within the lagoon and has created erosion holes near the spillway used for water exchange.

- Are non-native species found at the site?

Spartina was first discovered on Vashon Island in 1993 at Fern Cove on the northwest side of Vashon Island. Since then *Spartina* has been found within the site (Raab's Lagoon) as well as adjacent to the site (Point Heyer, Tramp Harbor), however populations found to date are small and have responded to management (Eisenberg et al 2001). Local organizations survey the island by boat and report findings to Washington Department of Agriculture for management (Dean, personal communication).

- Are there water quality concerns associated with the site?

Water quality within the reserve has been adversely affected by: 1) failing residential septic systems, 2) gray water discharges from residential or boating sources, 3) historic industrial activity and 4) current and historic agricultural practices in watersheds surrounding the reserve. Fecal pollution and paralytic shellfish poisoning concerns have led to the decertification of several shellfish areas within Quartermaster Harbor.

Department of Health monitors Quartermaster Harbor for fecal coliform to assess whether fecal waste is reaching the water and to determine whether pollution could be pathogenic. Recent reports suggest that shellfish growing areas in Quartermaster Harbor are not being impacted by fecal pollution (Determan 2003a). Despite having a reputation for fecal pollution, Quartermaster Harbor is In 2001 Quartermaster Harbor had the second highest impact index score (an index calculated based on the number of days PSP levels exceeded FDA action levels and the extent PSP levels exceeded FDA action levels) for paralytic shellfish poisoning (Determan 2003b; figure 3). Paralytic shellfish poisoning (PSP) is a result of a toxin that accumulates in marine animals that feed either

directly on toxic phytoplankton or on consumers of toxic phytoplankton. Evidence of paralytic shellfish poisoning in Quartermaster Harbor can be an indicator of disturbed nutrient cycles. However, given the uncertainty associated with the ultimate cause of PSP, and the possibility that regional phenomena are causing PSP within the harbor, it is difficult to ascertain whether nutrient cycling is disrupted within the harbor. PSP is capable of causing mass mortalities among shellfish-eating animals including birds, fur seals, foxes, sea otters (Kvitek and Beitler, 1988) and humpback whales (Geraci et al. 1989).

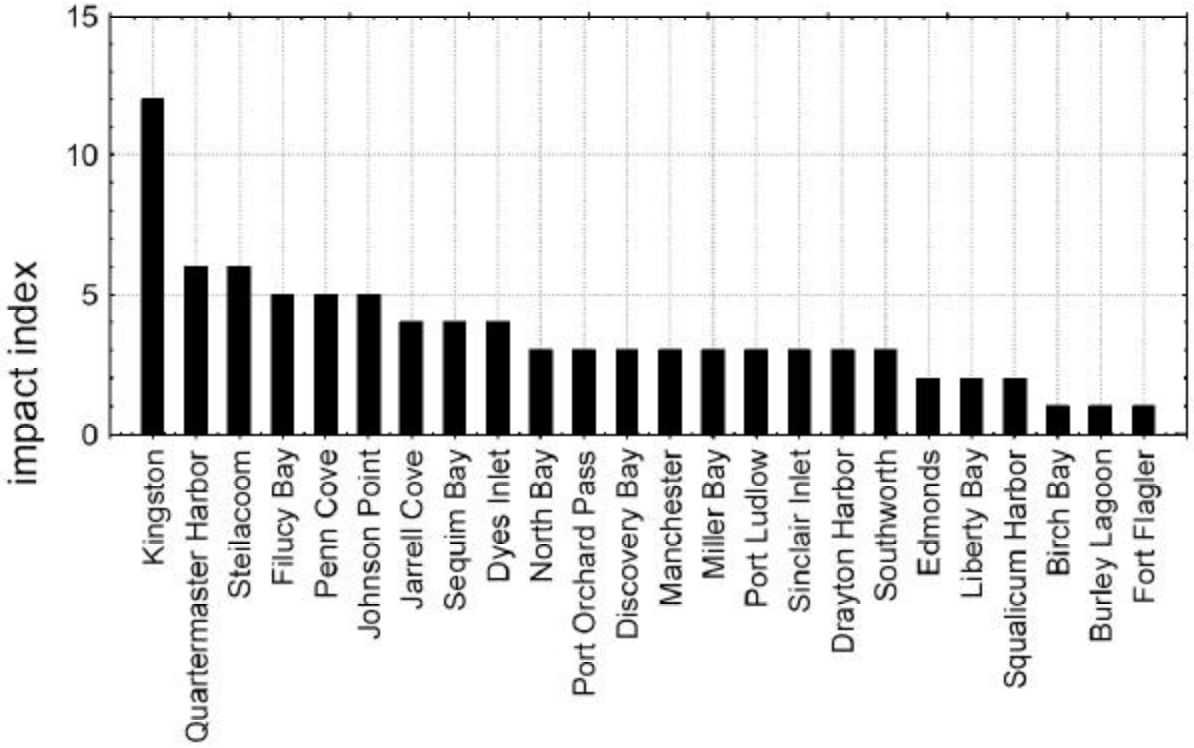

Figure 3: Ranking of PSP-impacted sites in Puget Sound during the year 2001 (from Determan 2003b).

Quartermaster Harbor is poorly flushed and inner portions of the harbor are potentially nutrient sensitive and are showing signs of eutrophication (Harrison et al. 1994; Battelle et al. 2000).

Sediment contaminants have been examined within the harbor through the evaluation of fish tissue samples. These surveys indicate that the health of Quartermaster Harbor is good based on fish tissue chemistry, and flatfish tissue samples indicate relatively low levels of contaminants in fish, suggesting little risk to humans who consume fish from this area (Crecelius et al. 1989). Elevated concentrations of two pollutants were found within the harbor: mercury levels were elevated in flounder samples, and PCBs loads were in the higher range (201 to 2000 micrograms/kg) compared to other areas in Puget Sound. PCB levels in flatfish muscle tissue were similar to other non-urban bays in the Central Basin of Puget Sound, but higher than non-urban bays elsewhere (Crecelius et al. 1989).

- Are there signs of habitat loss within the site?

As a result of the constrained tidal flow into Raab's lagoon, a quantity of intertidal habitat adjacent to the reserve has been lost. Additionally, a land bridge between Vashon and Maury Islands at the location of Portage has been augmented such that Portage is no longer under water at high tide. This has certainly caused changes in the habitat surrounding Portage in addition to affecting water flushing within Quartermaster Harbor. On the southeast shoreline of Maury Island "Eelgrass patches north and south of the [barge loading dock] site cover larger areas and are more continuous in nature. Eelgrass patches at the [barge loading dock] site may be fragments of larger eelgrass beds disturbed by past mining activity" (FEIS Maury Island Glacier Northwest Gravel Mine, June 2000). In addition, Norris et al. provided evidence that eelgrass communities in the area of the existing gravel dock may be expanding. The community of Gold Beach on Maury Island appears to be built on filled intertidal lands, which has led to the loss of intertidal habitat and affected nearshore drift and associated processes. Bulkheads built to protect residential development and roads are found on private tidelands adjacent to much of the reserve and have impacted natural erosional/accretional processes. Sixty percent of the shoreline has been modified.

- Are there signs of habitat loss within the biogeographic region?

Yes, several major bays in the Central Puget Sound region have been filled, diked, and dredged extensively. Over the past century, 97 percent of the shallows and flats in the Duwamish Estuary and Elliot Bay have been lost (Blomberg et al. 1988) and 95 percent of the estuarine habitat in Commencement Bay has been lost to development (Bortelson et al. 1980). The proportion of marine shorelines modified in Central Puget Sound is higher than any other part of Washington with 59.1% of shorelines modified and 18.3% of shorelines comprised of man-made materials (Berry et al. 2001). In addition to intertidal modifications, the navigation channels and berthing areas of most major bays in Central Puget Sound are dredged on a regular basis for navigational purposes.

- Are ecosystem processes (e.g., freshwater flow, littoral drift, nutrient cycling, etc.) intact?

Ecosystem processes appear to be relatively intact. The largest single source of freshwater flow into the reserve is Judd Creek, an unimpeded stream draining a significant portion of Vashon Island. Freshwater also enters the reserve through a number of freshwater seeps draining into the intertidal. Sediment flow along the shoreline appears to be relatively intact, however shoreline modification is likely preventing sediment flow which is of greatest concern along southern Maury Island because this portion of the reserve is exposed to higher energy waves and is therefore more likely to have sediment starved beaches. Point Robinson is the terminus for two nearshore drift cells (Chrzastowski 1982) within the reserve and this site is described as having a 'steep beach' to the north of the sand spit at the point (Beach Assessment Program 1996). While the sand spit appears to be healthy, a steep beach is a potential sign of sediment starvation.

2. Risks to the ecosystem or feature of interest (If applicable)
    - Can threats contributing directly to the area's decline be prevented through reserve establishment?

Actions undertaken under implementation of the Aquatic Reserves Program by DNR are unlikely to directly either mitigate or eliminate many threats to the ecosystems and natural resources found within the site. However, Aquatic Reserve Status would likely reduce some threats and facilitate the reduction of others. The DNR owned lands within this site are primarily subtidal lands and these lands are not the source of most threats to resources found within the reserve. Activities on DNR leased properties include marina operations that may be shading eelgrass habitat and may be contributing to water pollution within Quartermaster Harbor. Additionally, a lease application has been received by DNR for a barge loading dock from the sand and gravel mine on the eastern shore of Maury Island. Surveys suggest bardge loading operations may impact the nearshore environment by shading eelgrass beds, spilling gravel, prop wash from tug operations, and noise pollution from barge filling and tug operations (EVS 2000). Impacts (from the barge loading operation) would be limited to the site of action (FEIS Maury Island Glacier Northwest Gravel Mine, June 2000). Power transmission right-of-ways in the vicinity of Point Robinson contribute few if any impacts to the reserve. Threats originating from leased lands administered by DNR could be influenced through voluntary or mandatory changes in operations. Leases posing threats to the reserve might not be renewed. No leases will be terminated prematurely as a result of reserve designation.

The objective of an environmental aquatic reserve is to help ensure environmental protection through conservation and restoration (2000 Aquatic Reserve Programmatic EIS). Because land use adjacent to an aquatic reserve may greatly impact the site and the ability to achieve the site's conservation goals, the success of an aquatic reserve may be contingent on the conservation and restoration of lands adjacent to the reserve. Reserve designation will likely influence funding, conservation and restoration priorities for several regional programs including the derelict vessel removal program administered by DNR.

3. Restoration potential
    - Is there pending restoration at the site?

Restoration adjacent to the reserve site is limited to shoreline re-vegetation projects at this time. Approximately 6.5 miles of shoreline were inventoried during 2000 in a project sponsored by King County in an effort to identify potential restoration or conservation projects (Bloch et al. 2002). While elements of this survey have resulted in conservation and restoration proposals, no projects have received funding to date. In addition to restoration projects that have as their goals removal/re-construction of shoreline armoring and riparian vegetation planting, there are proposals that may involve restoration of a salt marsh in the vicinity of Portage, or rehabilitation of the spillway at Raab's lagoon. There are a number of ongoing efforts to reduce septic inputs to Quartermaster Harbor and to reduce gray-water inputs to the vicinity of the reserve, which would reduce or eliminate ongoing ecosystem stresses.

- Would restoration benefits extend beyond site boundaries?

Most restoration benefit from active restoration proposals or activities would be restricted to the reserve area. Nearshore restoration is likely to enhance habitat along migratory corridors used by endangered Chinook salmon and bull trout in addition to other species of salmon. Additionally, efforts to reduce fecal pollution within the site may have some influence on nearby areas.

4. Special value for biodiversity or species diversity
    - Does the proposed site capture habitat used regularly by species of special conservation interest?

The site has several features of conservation interest including extensive eelgrass beds, kelp beds, limited salt marsh habitat, herring spawning grounds, surf smelt spawning grounds, sand lance spawning grounds, Chinook salmon migratory corridors, bull trout migratory corridors, and bottomfish rearing habitat (See figures in appendix A). The site has also been identified as an important wintering ground for western grebe populations (Cullinan 2001). Juvenile Chinooks and chum salmon migrants use shallow water habitats for rearing during spring and summer. Chinook salmon as young of the year to maturing adults rear in both shallow and deep-water habitats throughout the year in this area. Shallow water areas are also productive rearing habitats for all age classes of cutthroat trout. Other salmon migrate through the area seasonally.

In 2002 WDFW conducted a bottom trawl in the harbor and found a high diversity and concentration of flatfish including English sole, speckled and Pacific sanddabs, and southern rock sole. The trawl also revealed a high abundance of large macroinvertbrates including Dungeness crab, red rock crab, red sea cucumber, and sea stars. During visits to nearshore habitat along the eastern shore of Maury Island, WDFW divers have observed fish characteristic of rocky habitats including lingcod, copper and brown rockfishes, and red Irish lord (Palsson, personal communication).

- Does the proposed site capture vulnerable habitats, life stages or populations? (Vulnerable habitats, life stages or populations include: seal haul-outs, breeding bird aggregations or rookeries, seasonal bird aggregations, seasonal fish aggregations (feeding or breeding), or fish spawning aggregations)

The boundaries of the site capture the majority of the documented extent of the Quartermaster Harbor herring stock spawning area as well as a small portion of its pre-spawning holding area (figure 4). Forage fish, including herring, sand lance, and surf smelt, are critical components of the Puget Sound food web (Long 1982), and are food for many of the species found within the aquatic reserve including salmon and many of the birds that winter in Quartermaster Harbor.

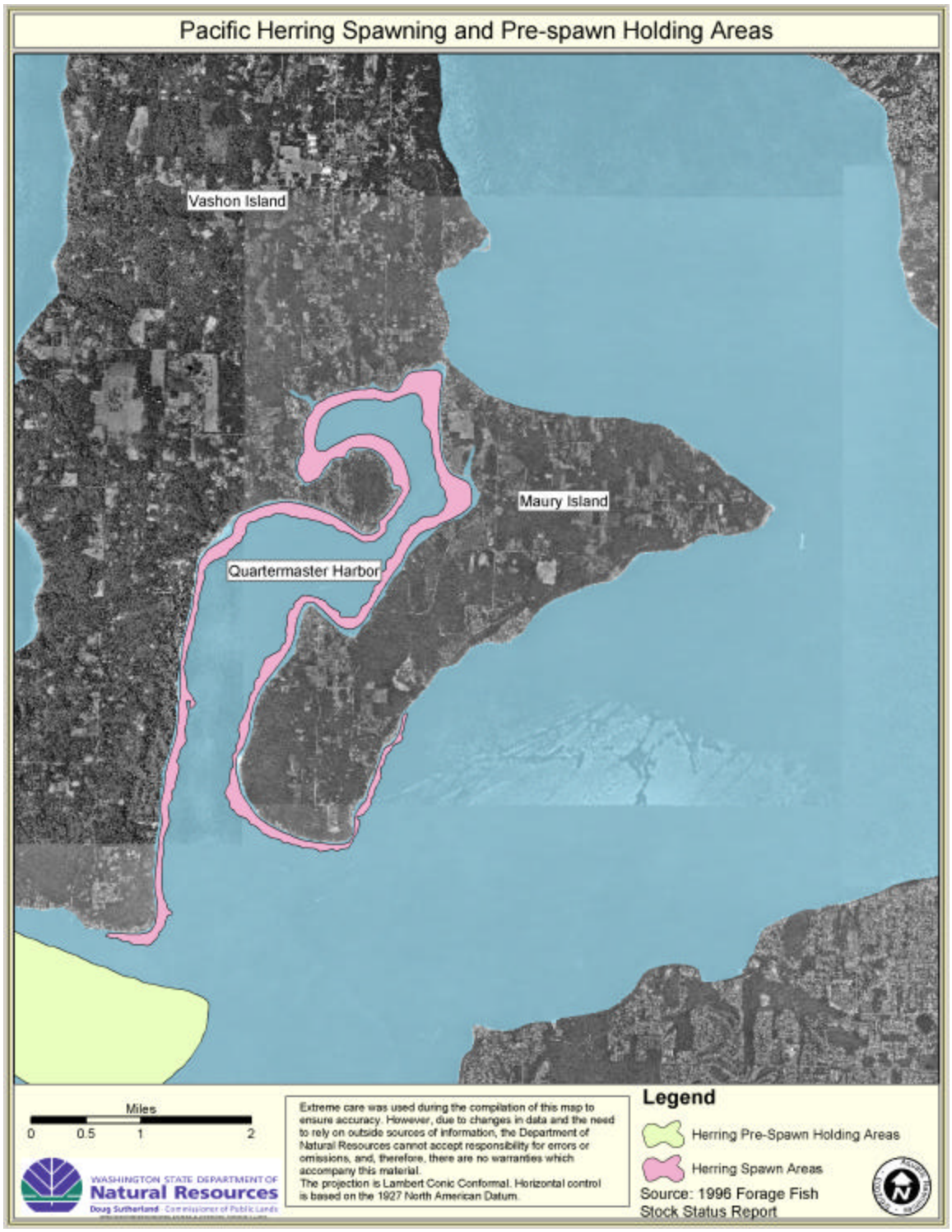

Figure 4: Herring spawning area for Quartermaster Harbor stock.

Because forage fish have relatively short generations and are believed to return to their natal spawning areas to spawn, the impairment of spawning areas could lead to the collapse of local forage fish populations. Of similar importance are eelgrass beds found within the reserve that are the primary spawning substrate for herring in this area and provide valuable nursery habitat for a variety of fish.

5. Ecological processes that sustain the aquatic landscape
    - Would protection of the site protect/maintain ecological processes?

It is unlikely that protection of the site will, in isolation, protect or maintain all ecological processes at the site. Freshwater entering the reserve from surface or groundwater sources are important to the site and will likely be maintained through other regulatory programs. Nearshore sediment transport may be protected to some degree by reserve management activities. In addition, by establishing the area as a reserve, DNR, through its management authority, can protect state-owned aquatic lands where herring spawning substrate exists by restricting activities that will interfere with herring spawning and associated spawning substrate and holding areas.

6. The cultural quality of the site
    - Does the site contain or protect significant cultural resources? (Does the site contain heritage, historical, or cultural resources that are eligible for the Washington State Register of Historic Places, RCW27.34.220 or the National Register of Historic Places? Evaluate the value of those described in the proposal from a regional or statewide basis (ex. sites listed on the state or national historical register or significant historical indigenous use areas would have high values.)

The following sites of historic or cultural importance have been identified. The portage site and historic clam middens are not within the reserve boundaries but are located on private tidelands adjacent to the site:

- Robinson Point Lighthouse: Located at the NE corner of Maury Island is on the National Register of Historic Places. The Lighthouse was originally constructed as a fog signal in 1885, and the current lighthouse was built in 1915, with a 38-foot tower and fifth-order Fresnel lens.

- Historical portage from the NE corner of Quartermaster Harbor to the Puget Sound. This site is not registered on a historic register. When the Portage still submerged at high tide, the area was a favorite fishing and hunting ground of the Nisqually people. Nets in this area were used to capture abundant waterfowl (Van Carey 1985).

- Historic clam middens were excavated on the north shore of the Burton Peninsula in 1996 by University of Washington's Department of Archaeology (Beach Assessment).

E. Habitats and features represented within the site

1. Is the site a good example (relatively undisturbed) of representative habitat as compared with the overall reserve program goal?

    - Does the proposed site capture species or habitats that are much less common within the biogeographic region than they were historically?

Harbors and bays the size of Quartermaster harbor are relatively uncommon in Puget Sound, and most have been heavily influenced by anthropogenic development. Drift along the south shore of Maury Island is northeast from Piner Point to a convergence zone at Point Robinson, with no reversals in direction. Such long, relatively uninterrupted drift cells as this are becoming a rare observation in the Central Puget Sound basin. Such physical features are critical for the maintenance and development of accretion shore features. Additionally, a minimally armored accretion shore feature like the sand spit found at Point Robinson is an uncommon observation within Puget Sound.

Quartermaster Harbor is identified by the Audubon Society as an Important Bird Area by in recognition of its importance for wintering marine birds, particularly western grebes (Cullinan 2001).

2. Does the site include habitat types that are under-represented in the aquatic reserves program or marine protected area network?

    - Does the site contain representative habitats not otherwise protected in the network of protected areas or aquatic reserves?

The site includes herring spawning and holding habitat as well as important bird migratory habitat identified in Cullinan 2001. Also, see E.1 above.

3. Does the site include a biogeographical location that is under-represented in the aquatic reserves program or marine protected area network?

    - Is the site located in a biogeographic region or sub-region that is underrepresented in the existing reserve network?

There are a number of existing parks within Central Puget Sound. Within the boundaries of the site are four developed park sites and one undeveloped park site. The parks within the reserve are: Point Robinson, Dockton, Burton Acres, and the Maury Island Marine Park. The undeveloped site is Lost Lake. Similar state, county and local parks within Central Puget Sound include: Dash Point, Saltwater State Park, Manchester State Park, Blake Island State Park, Point Defiance Park, Me Kwa Mooks Park, Lincoln Park, Seahurst Park, and Lisabeula Park. However, none of these areas were established to protect habitat, species or represent some unique feature of the bioregion. They were established primarily as open space for public use.

There are only two marine protected areas within the central basin of Puget Sound. The nearest is Titlow Beach, which was established in 1994 by the City of Tacoma to support research and education activities by providing a non-consumptive recreation diving area. The second is the Foulweather Bluff Nature Conservancy Preserve, established in 1966 by the Nature Conservancy of Washington to preserve lowland forest, an enclosed brackish marsh and tidelands. (Murray 1998). The Middle Waterway and Olympic View aquatic reserves, within Commencement Bay, were established by DNR in 2000. These two sites are presently being reviewed according to the current evaluation criteria and process established for the DNR Aquatic Reserve Program.

F. Viability of the occurrences of interest

1. Site features meet the intent of the reserve
    - Are species, habitats or ecosystem processes consistently associated with reserve site?

Those features described above in section C are consistently observed within the site. Some features, including herring spawning and marine bird aggregations are observed seasonally.

2. Number of conservation targets
   (SEE "Special value for biodiversity or species diversity" section D.4)
3. Number of ecological processes
    - Does the site contain unique or distinctive physical habitat features (e.g., oceanographic gyre, oceanographic sill, natural beach spit, etc)?

Harbors and bays the size of Quartermaster Harbor are relatively uncommon in Puget Sound, and most have been heavily influenced by anthropogenic development. Drift along the south shore of Maury Island is northeast from Piner Point to a convergence zone at Point Robinson, with no reversals in direction. Such long, relatively uninterrupted drift cells as this are becoming a rare observation in the Central Puget Sound basin. Such physical features are critical for the maintenance and development of accretion shore features. Additionally, a minimally armored accretion shore feature like the sand spit found at Point Robinson is an uncommon observation within Puget Sound.

    - Does the site contain unique or distinctive biological processes (larval rearing zooplankton concentrations, aggregation sites, etc.)?

Quartermaster Harbor represents one of only 18 distinct Pacific herring spawning areas observed in Puget Sound (Lemberg 1997). This spawning area is approaching the southern extreme of herring spawning within Puget Sound with only one spawning stock further south – Squaxin Pass.

G. Defensibility of the site

1. Complementary protection within a reserve or protected area network.
   (See: *Habitat types that are under-represented in the aquatic reserves program or marine protected area network Section E.2)*

2. Connectivity to a reserve or protected area network and/or for species and/or habitats
   - Is site adjacent to existing marine or freshwater protected areas administered for conservation or restoration purposes?

   There are no existing marine or freshwater protected areas adjacent to the site.
   - Does the site provide regional habitat connectivity through any of the following functions? Refuge (predator, physiological, high energy), food production, migratory corridors, spawning, nursery or rearing, riparian vegetation, adult habitat, other functions. Connectivity should be established in a referenced publication(s).

     - **Migratory Corridor & Adult Habitat**:
       i. Quartermaster Harbor is identified by the Audubon Society as an Important Bird Area by in recognition of its importance for wintering marine birds, particularly western grebes (Cullinan 2001).
       ii. The King County Department of Natural Resources beach seining report (not published) indicates that the eastern shore of Maury Island to be a route for out-migrating salmon from several hatcheries.
     - **Spawning**
       i. Quartermaster Harbor represents one of only 18 distinct Pacific herring spawning areas observed in Puget Sound. This spawning area is approaching the southern extreme of herring spawning within Puget Sound with only one spawning stock further south – Squaxin Pass (Lemberg 1997).

3. Appropriate size to be sustainable
   - Is area large enough to be self-sustaining?

The proposed site is a large area (approximately 3200 acres and 20 miles of shoreline), however many of the species found at the site spend only part of their life within the site. Therefore species including salmonids, marine birds, and Pacific herring will require appropriate management elsewhere to ensure their continued health and use of the site. The area of the reserve includes portions of two drift cells providing sediment to the sand spit found at Point Robinson. The site includes several types of submerged aquatic vegetation, including eelgrass beds and kelp beds that are of sufficient size to be self-sustaining. Surf smelt and sand lance spawning beaches in and adjacent to the site are fed primarily by sediment local to the area.

4. Ability to persist over time

- Can site be successfully managed to maintain the features of interest?

Because the area of the reserve is management by DNR, the area can be managed to maintain the features of interest at the site. However, the majority of the adjacent intertidal areas are not owned and managed by the state. Therefore, it is critical that adjacent, non state-owned intertidal and upland areas be managed in a way that supports the features of the reserve. This will require cooperation by local government and citizens.

- Are there known anthropogenic or natural threats to the continued viability of the site?

The impairments identified in section D.1 & D.2 are the result of activities that may continue in the area that may threaten the continued viability of features of the site.

5. Known or anticipated activities that endanger the site or habitat
   - Are proposed land uses or modifications compatible with reserve designation? (Modifications of interest are described in Appendix A)?

   The following proposed and potential upland and water dependent land uses may not be compatible with the reserve designation:
   1. Proposed expansion of Quartermaster Marina in Inner Quartermaster Harbor
   2. Re-construction and operation of proposed gravel barge loading facility along the eastern shore of Maury Island.
   3. Continued residential shoreline armoring.
   4. Continued placement of private docks and mooring buoys in critical aquatic habitat (primarily in Quartermaster Harbor).
   5. Anthropogenic activities that continuing the decline of water quality in Quartermaster Harbor.

6. Potential for factors contributing directly to the area's decline to be prevented
   - Would reserve status provide protection for habitats, species or processes of interest from encroachment?

   Yes, at a minimum DNR management of the reserve area would require that management activities (that DNR permits) be required to achieve the objectives of the reserve. However, the success of the reserve is also contingent on the cooperation of local government and citizens to cooperation in developing a management plan that provides adequate protection.

H. Manageability of the site

1. Coordination with other entities, including local jurisdictions and current leaseholders

- King County (see 1-10-01 letter from Ron Sims, King County Executive) supporting the reserve and "collaborative land management efforts…. to develop a land management plan that ensures adequate protection for these resources."

- Puyallup Tribe of Indians. Potential cooperator. The area of the Maury Island Reserve is their exclusive usual and accustomed fishing area. The Tribe would also have interest in cultural resources that may exist at the site.

- Washington Department of Fish and Wildlife (WDFW). WDFW regulates development in the reserve area through the Hydraulic Permit Application Process.

- Vashon Maury Island Land Trust

- Other local aquatic resource steward organizations

    - Has another entity previously identified this site or areas within the site as a priority for protection? *(Examples include Important Bird Areas (Cullinan 2001), priority areas for Research Natural Area Designation (Dyrness et al. 1975), or priority areas for conservation (e.g., through ecoregional planning, Natural Heritage Program research (Kunze 1984), or similar process (Dethier 1989))*

The Puget Sound Task Force of the Pacific Northwest River Basins Commission (1970) identified the marine shorelines of Quartermaster Harbor as one of 89 outstanding natural areas found within Puget Sound and the adjacent waters. The site was proposed for conservation by a regional conservation organization (People For Puget Sound). Subsequent to this initial proposal, The Audubon Society has listed Quartermaster Harbor as an Important Bird Area in recognition of its importance for wintering marine birds, especially western grebes (Cullinan 2001). The Nature Conservancy has also recognized much of Quartermaster Harbor as an area of conservation interest in their recent Ecoregional Conservation Assessment (TNC 2003). These planning efforts and other information have been referenced in letters supporting reserve status by the following elected officials: Ron Simms (King County Executive), Jim McDermott (U.S. Congress 7th District), Joe McDermott (Washington State Representative 34th District), Eileen Cody (Washington State Representative 34th District), and Erik Poulsen (Washington State Senator 34th District).

2. Potential cooperative partners for management, monitoring, or enforcement
    - Have potential cooperative management partners been identified? [1]

See H.1.

[1] This criterion is intended to gauge the amount of planning and effort that has already been invested in the development of a protection plan for the area of interest. These criteria represent best management principles that the Aquatic Reserve program will seek to employ, and will be used to give preference to proposals that are in more advanced stages of development.

3. Adjacent natural areas or public lands
    - Is site adjacent to terrestrial protected areas managed for conservation or restoration purposes?

The site is adjacent to several large parcels in public ownership including:

- Robinson Point Light House (National Historic Register). Northeast corner of Maury Island includes about 1500 feet of shoreline. Park area is leased by Vashon Park District from the U.S. Coast Guard. The site is dominated by a sand spit at the toe of a bluff.
- Maury Island Marine Park. Located southwest of Robinson Point. The site is a 300-acre former mine site purchased by King County in 1994. The site includes about one mile of shoreline.
- King County owns an undeveloped site (about 50 acres) along the lower western shore of Quartermaster Harbor. The site includes about 600 feet of shoreline

Two additional public parks, Dockton Park managed by King County Park District and Burton Acres Park managed by the Vashon Park District, are adjacent to the site. These sites are managed primarily for recreation.

4. Provide a description of how to measure success (i.e., monitoring).
    - *See 'Kinds of monitoring needed'* below

5. Describe kinds of monitoring needed
    - Does reserve proposal include a monitoring plan that measures reserve progress towards goals and provides for adaptive management?[2]

The reserve proposal does not yet include a monitoring plan. The site is included in several survey efforts associated with the Puget Sound Ambient Monitoring Program. Regional surveys that include monitoring sites within or adjacent to the reserve include bottomfish abundance (Palsson, personal communication), paralytic shellfish poisoning (Determan 2003b), and marine birds (Nyeswander, personal communication). Additionally, recent nearshore fish community studies (Higgins, personal communication), and shoreline inventories (Bloch et al. 2002) have taken place within the reserve. Members of Vashon Audubon Society have compiled bird lists and record bird observations for at least three localities with the site – Point Robinson, Maury Island Marine Park and Quartermaster Harbor.

[2] This criterion is intended to gauge the amount of planning and effort that has already been invested in the development of a protection plan for the area of interest. These criteria represent best management principles that the Aquatic Reserve program will seek to employ, and will be used to give preference to proposals that are in more advanced stages of development.

6. Kinds of enforcement needed to make sure incompatible uses and impacts do not encroach on reserve.
    - What kind of enforcement is needed to prevent incompatible uses and impacts from encroaching on the reserve?

Reserve designation must be accompanied by the cooperation of the stakeholders identified in H.1, particularly King County, in order to develop management actions that are administered consistently by all agencies with management authority in the reserve areas.

7. Does the site serve or conflict with the greatest public benefit? Does reserve status represent the greatest public benefit?

Quartermaster Harbor is a relatively large, shallow, protected embayment. Such bays are highly sought-after for recreational boating facilities and the harbor includes the majority of recreational moorage facilities on Vashon or Maury Island, which have a combined population of approximately 10,500. The shorelines surrounding the reserve (primarily in Quartermaster Harbor) are heavily armored as a result of residential development with 60% of the shorelines armored by bulkheads or altered by diking (Berry et al. 2001). Shoreline modification on the island is likely affecting sediment transport and wave energy and reducing spawning opportunities for obligate intertidal spawning forage fish like surf smelt and sand lance. A proposed gravel barge loading facility along the south shore of Maury Island would likely disturb or displace nearshore species during dock construction and ship loading (EVS 2000). Additionally, the operation of the mining facility creates potential for gravel spillage in the local nearshore ecosystem (Norris et al. 2000). The Final Environmental Impact Statement, Maury Island Glacier Northwest Gravel Mine, Volume 1, June 2000 identifies mitigation measures that can be taken to reduce these impacts. Recreational clam harvests take place at Burton Acres and Point Robinson Parks.

- Is reserve status compatible with existing or proposed adjacent uses?

Generally, the adjacent land-use zoning and shoreline zoning in and adjacent to the site are compatible with reserve status (see section B.4 and attached Shoreline Zoning and Upland Zoning maps). However, in practice there are some sections of the site where adjacent existing and proposed uses that could conflict with reserve status. These include the following:

- The stretch of upland adjacent areas to Maury Island's eastern shore, roughly 40% of the uplands adjacent to the eastern shore of Maury Island (see attached Adjacent Upland Zoning map) include two sections of high-density development, Gold Beach and Sandy Shores. The Gold Beach development extends on fill over historic intertidal habitat. Both developments are heavily armored. There is also a 235-acre site located between these two developed areas that are zoned for gravel mining. There is presently a proposal to mine up to 7.5 million tons of sand and gravel annually from the site for a period of 11 to 50 years, depending on the rate of extraction. The proponents are also proposing to build a loading dock and several series of dolphins, to load and moor up to four, 10,000-ton barges (330 by 80) or a greater number of smaller barges being loaded daily (Final Environmental Impact Statement, Maury Island Glacier Northwest Gravel Mine, Volume 1, June 2000).
- Inner Quartermaster Harbor contains many private docks, a mooring field, individual moorage, and two marinas. The Quartermaster Harbor Marina is being proposed for expansion.

- Assess the direct use, indirect use, option, and non-use values associated with the site.

Most direct uses that would be adverse to an Aquatic Reserve occur on private property adjacent to the reserve site. Direct uses that might be directly affected by reserve designation would include: non-tribal geoduck harvest in tracts within reserve boundary; leases for two existing marinas in inner Quartermaster Harbor and the Dockton Park transient dock; lease application for gravel barge loading facility on Maury Island. The southbound shipping lanes between Seattle and Tacoma run just offshore of Point Robinson and along the western and southern shores of Maury Island. Approximately 4,500 ships per year travel through this area (King County DNR 1996).

Direct use values that have limited effect on the reserve include recreational diving. Relict pilings and sunken vessels along Maury Island's south shore provide popular recreational diving sites where a variety of groundfish can be consistently viewed. Salmon fishing occurs along Maury Island and off Point Robinson. Additionally, small amounts of shellfish are harvested in the intertidal at Point Robinson and Burton Acres parks.

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